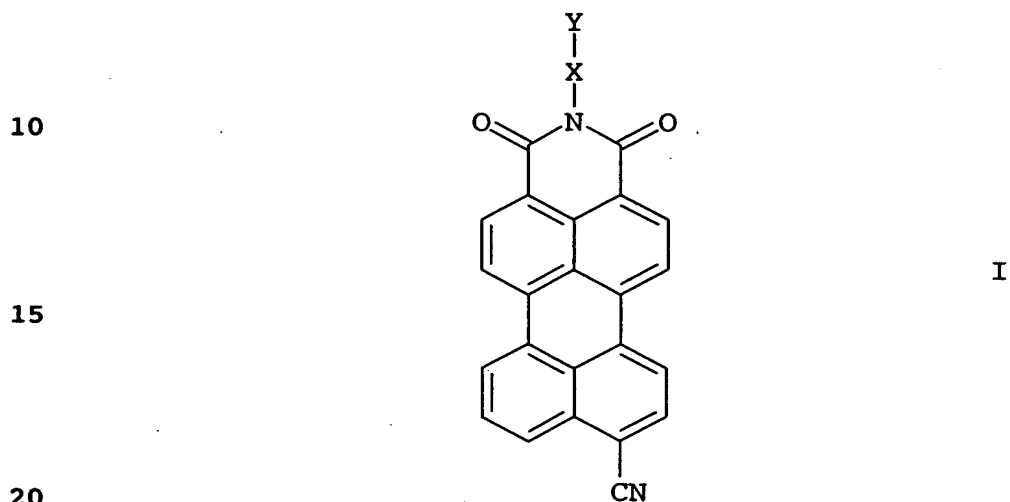


We claim:

1. A 9-cyano-substituted perylene-3,4-dicarboxylic monoimide of  
the general formula I



where the variables are defined as follows:

X is a chemical bond;

C<sub>1</sub>-C<sub>30</sub>-alkylene whose carbon chain may be interrupted by one or more -O-, -S-, -NR<sup>1</sup>-, -CO- and/or -SO<sub>2</sub>- moieties, and which may be substituted by -COOR<sup>1</sup>, -SO<sub>3</sub>R<sup>1</sup>, cyano, C<sub>1</sub>-C<sub>6</sub>-alkoxy, aryl which may be substituted by C<sub>1</sub>-C<sub>18</sub>-alkyl and/or C<sub>1</sub>-C<sub>6</sub>-alkoxy, and/or be mono- or polysubstituted by a 5- to 7-membered heterocyclic radical which is bonded via a nitrogen atom and may contain further heteroatoms and be aromatic;

C<sub>5</sub>-C<sub>8</sub>-cycloalkylene whose carbon framework may be interrupted by one or more -O-, -S-, -NR<sup>1</sup>-, -CO- and/or -SO<sub>2</sub>- moieties and/or may be mono- or polysubstituted by C<sub>1</sub>-C<sub>12</sub>-alkyl, -COOR<sup>1</sup>, -SO<sub>3</sub>R<sup>1</sup>, cyano and/or C<sub>1</sub>-C<sub>6</sub>-alkoxy;

arylene or hetarylene, each of which may be mono- or polysubstituted by C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>1</sub>-C<sub>6</sub>-alkoxy, cyano, -COOR<sup>1</sup>, -SO<sub>3</sub>R<sup>1</sup>, -CONH-R<sup>1</sup> and/or -NH-COR<sup>1</sup>;

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C<sub>1</sub>-C<sub>20</sub>-alkylarylene or -hetarylene whose alkylene group may in each case be interrupted by one or more -O-, -S-, -NR<sup>1</sup>-, -CO- and/or -SO<sub>2</sub>- moieties and which may in each case be mono- or polysubstituted by -COOR<sup>1</sup>, -SO<sub>3</sub>R<sup>1</sup>, -CONHR<sup>1</sup>, -NHCOR<sup>1</sup>, cyano, C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>1</sub>-C<sub>6</sub>-alkoxy and/or a 5- to 7-membered heterocyclic radical which is bonded via a nitrogen atom and may contain further heteroatoms and be aromatic;

aryl- or hetaryl-C<sub>1</sub>-C<sub>20</sub>-alkylene, whose alkylene group may in each case be interrupted by one or more -O-, -S-, -NR<sup>1</sup>-, -CO- and/or -SO<sub>2</sub>- moieties and which may each be mono- or polysubstituted by -COOR<sup>1</sup>, -SO<sub>3</sub>R<sup>1</sup>, -CONHR<sup>1</sup>, -NHCOR<sup>1</sup>, cyano, C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>1</sub>-C<sub>6</sub>-alkoxy and/or a 5- to 7-membered heterocyclic radical which is bonded via a nitrogen atom and may contain further heteroatoms and be aromatic;

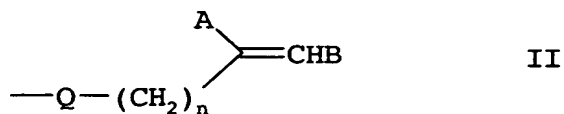
Y is a functional group Y' or a polymerizable group P;

or

X-Y together is an R radical;

Y' is amino, hydroxyl, -COOH, -SO<sub>3</sub>H, chlorine or bromine;

P is a radical of the general formula II



A, B are each independently hydrogen, C<sub>1</sub>-C<sub>6</sub>-alkyl or phenyl, or are together a cyclopentene or cyclohexene ring which contains the double bond to which A and B are bonded;

Q is a chemical bond;

an -O-, -NR<sup>2</sup>-, -S-, -OCO-, -OCOO-, -OCONR<sup>3</sup>-,  
 -NR<sup>3</sup>CO-, -NR<sup>3</sup>COO-, -NR<sup>3</sup>CONR<sup>4</sup>-, -CO-, -COO-,  
 -CONR<sup>3</sup>-, -SO<sub>2</sub>-O-, -SO<sub>2</sub>NR<sup>3</sup>-, -O-SO<sub>2</sub>- or -NR<sup>3</sup>SO<sub>2</sub>-  
 moiety;

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n is 0, 1, 2 or 3;

R is hydrogen;

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C<sub>1</sub>-C<sub>30</sub>-alkyl whose carbon chain may be interrupted  
 by one or more -O-, -S-, -NR<sup>1</sup>-, -CO- and/or -SO<sub>2</sub>-  
 moieties, and which may be substituted by cyano,  
 C<sub>1</sub>-C<sub>6</sub>-alkoxy, aryl which may be substituted by  
 C<sub>1</sub>-C<sub>18</sub>-alkyl and/or C<sub>1</sub>-C<sub>6</sub>-alkoxy, and/or be mono-  
 or polysubstituted by a 5- to 7-membered  
 heterocyclic radical which is bonded via a  
 nitrogen atom and may contain further heteroatoms  
 and be aromatic;

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C<sub>5</sub>-C<sub>8</sub>-cycloalkyl whose carbon framework may be  
 interrupted by one or more -O-, -S- and/or -NR<sup>1</sup>-  
 moieties and/or may be mono- or polysubstituted by  
 C<sub>1</sub>-C<sub>6</sub>-alkyl;

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aryl or hetaryl, each of which may be mono- or  
 polysubstituted by C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>1</sub>-C<sub>6</sub>-alkoxy,  
 cyano, -CONHR<sup>5</sup>, -NHCOR<sup>5</sup> and/or aryl- or hetarylazo,  
 each of which may be substituted by C<sub>1</sub>-C<sub>10</sub>-alkyl,  
 C<sub>1</sub>-C<sub>6</sub>-alkoxy and/or cyano;

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R<sup>1</sup> is hydrogen or C<sub>1</sub>-C<sub>6</sub>-alkyl;

R<sup>2</sup> is hydrogen, C<sub>1</sub>-C<sub>6</sub>-alkyl, aryl, aryl-C<sub>1</sub>-C<sub>6</sub>-alkyl,  
 C<sub>1</sub>-C<sub>6</sub>-alkylcarbonyl, arylcarbonyl or formyl;

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R<sup>3</sup>, R<sup>4</sup> are each independently hydrogen; C<sub>1</sub>-C<sub>6</sub>-alkyl; aryl  
 or aryl-C<sub>1</sub>-C<sub>6</sub>-alkyl, each of which may be  
 substituted by hydroxyl, halogen, C<sub>1</sub>-C<sub>6</sub>-alkyl  
 and/or C<sub>1</sub>-C<sub>6</sub>-alkoxy;

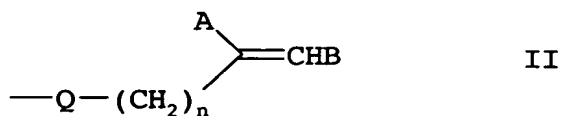
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R<sup>5</sup> is hydrogen; C<sub>1</sub>-C<sub>18</sub>-alkyl; aryl or hetaryl, each of  
 which may be substituted by C<sub>1</sub>-C<sub>6</sub>-alkyl,  
 C<sub>1</sub>-C<sub>6</sub>-alkoxy, halogen, hydroxyl, carboxyl and/or  
 cyano.

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2. A perylene-3,4-dicarboxylic monoimide of the general formula I as claimed in claim 1, in which the variables are defined as follows:

- 5 X is C<sub>1</sub>-C<sub>30</sub>-alkylene, whose carbon chain may be interrupted by one or more -O- and/or -CO- moieties, and which may be substituted by -COOR<sup>1</sup>, cyano, C<sub>1</sub>-C<sub>6</sub>-alkoxy and/or aryl which may be substituted by C<sub>1</sub>-C<sub>18</sub>-alkyl and/or C<sub>1</sub>-C<sub>6</sub>-alkoxy;
- 10 C<sub>5</sub>-C<sub>8</sub>-cycloalkylene which may be mono- or polysubstituted by C<sub>1</sub>-C<sub>12</sub>-alkyl, -COOR<sup>1</sup>, cyano and/or C<sub>1</sub>-C<sub>6</sub>-alkoxy;
- 15 arylene or hetarylene, each of which may be mono- or polysubstituted by C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>1</sub>-C<sub>6</sub>-alkoxy, cyano, -COOR<sup>1</sup>, -CONH-R<sup>1</sup> and/or -NHCOR<sup>1</sup>;
- 20 C<sub>1</sub>-C<sub>20</sub>-alkylarylene or -hetarylene whose alkylene group may in each case be interrupted by one or more -O- and/or -CO- moieties and which may in each case be mono- or polysubstituted by -COOR<sup>1</sup>, cyano, C<sub>1</sub>-C<sub>18</sub>-alkyl and/or C<sub>1</sub>-C<sub>6</sub>-alkoxy;
- 25 aryl- or hetaryl-C<sub>1</sub>-C<sub>20</sub>-alkylene, whose alkylene group may in each case be interrupted by one or more -O- and/or -CO- moieties and which may in each case be mono- or polysubstituted by -COOR<sup>1</sup>, cyano, C<sub>1</sub>-C<sub>18</sub>-alkyl and/or C<sub>1</sub>-C<sub>6</sub>-alkoxy;
- 30 Y is a functional group Y' or a polymerizable group P;
- or
- 35 X-Y together is an R radical;
- Y' is amino, hydroxyl, -COOH or bromine;
- P is a radical of the general formula II



## 50

- A, B are each independently hydrogen, C<sub>1</sub>-C<sub>6</sub>-alkyl or phenyl, or are together a cyclopentene or cyclohexene ring which contains the double bond to which A and B are bonded;
- 5 Q is a chemical bond;
- a -O-, -NR<sup>2</sup>-, -OCO-, -NR<sup>3</sup>CO-, -COO- or -CONR<sup>3</sup>-moiety;
- 10 n is 0, 1, 2 or 3;
- R is hydrogen;
- 15 C<sub>1</sub>-C<sub>30</sub>-alkyl whose carbon chain may be interrupted by one or more -O-, -NR<sup>1</sup>- and/or -CO- moieties, and which may be substituted by cyano, C<sub>1</sub>-C<sub>6</sub>-alkoxy, aryl which may be substituted by C<sub>1</sub>-C<sub>18</sub>-alkyl and/or C<sub>1</sub>-C<sub>6</sub>-alkoxy, and/or be mono- or polysubstituted by a 5- to
- 20 7-membered heterocyclic radical which is bonded via a nitrogen atom and may contain further heteroatoms and be aromatic;
- 25 C<sub>5</sub>-C<sub>8</sub>-cycloalkyl whose carbon framework may be interrupted by one or more -O- and/or -NR<sup>1</sup>- moieties and/or may be mono- or polysubstituted by C<sub>1</sub>-C<sub>6</sub>-alkyl;
- 30 aryl or hetaryl, each of which may be mono- or polysubstituted by C<sub>1</sub>-C<sub>18</sub>-alkyl, C<sub>1</sub>-C<sub>6</sub>-alkoxy, cyano and/or aryl- or hetarylazo, each of which may be substituted by C<sub>1</sub>-C<sub>10</sub>-alkyl, C<sub>1</sub>-C<sub>6</sub>-alkoxy and/or cyano;
- R<sup>1</sup> is hydrogen or C<sub>1</sub>-C<sub>6</sub>-alkyl;
- 35 R<sup>2</sup> is hydrogen, C<sub>1</sub>-C<sub>6</sub>-alkyl, aryl, aryl-C<sub>1</sub>-C<sub>6</sub>-alkyl;
- R<sup>3</sup> is hydrogen; C<sub>1</sub>-C<sub>6</sub>-alkyl; aryl or aryl-C<sub>1</sub>-C<sub>6</sub>-alkyl, each of which may be substituted by hydroxyl, C<sub>1</sub>-C<sub>6</sub>-alkyl and/or C<sub>1</sub>-C<sub>6</sub>-alkoxy.

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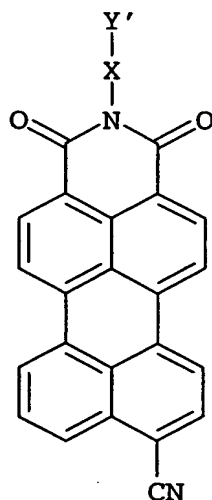
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3. A process for preparing perylene-3,4-dicarboxylic monoimides of the general formula Ia

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Ia

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where X and Y' are as defined in claim 1 or X-Y' together are one of the R radicals defined in claim 1, which comprises

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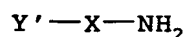
- a) brominating perylene-3,4-dicarboxylic anhydride in the 9-position using elemental bromine in concentrated sulfuric acid or an aliphatic monocarboxylic acid,

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- b) reacting the 9-bromoperylene-3,4-dicarboxylic anhydride obtained in step a) with copper(I) cyanide in excess in a high-boiling inert diluent, optionally with the addition of a basic nitrogen compound or of a nitrogen heterocycle as a catalyst, and

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- c) reacting the 9-cyanoperylene-3,4-dicarboxylic anhydride obtained in step b) with a primary amine of the general formula IV



IV

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in water or an inert organic solvent, optionally with the addition of an imidation catalyst, to give the desired 9-cyanoperylene-3,4-dicarboxylic monoimide of the formula Ia.

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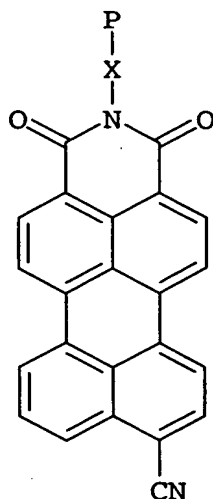
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4. A process for preparing perylene-3,4-dicarboxylic monoimides of the general formula Ib

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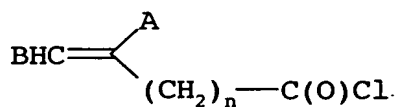


Ib

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where X is as defined in claim 1 and P is one of the radicals of the formula II defined in claim 1 where Q is -OCO- or -NHCO-, which comprises reacting a perylene-3,4-dicarboxylic monoimide of the formula Ia as defined in claim 3 where Y' is amino or hydroxyl with a carbonyl chloride of the general formula V

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V

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where the variables are as defined in claim 1 in an inert aprotic diluent, with the addition of a nitrogen base.

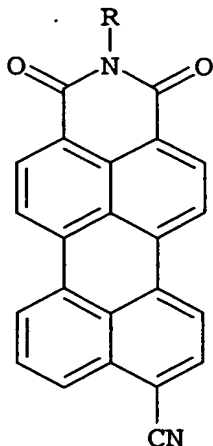
5. A process for preparing perylene-3,4-dicarboxylic monoimides of the general formula Ic

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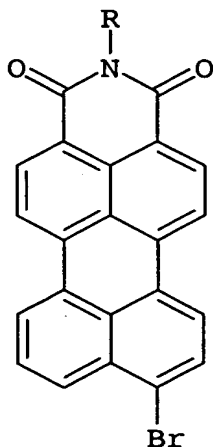
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Ic

where R is as defined in claim 1, which comprises converting a 9-bromoperylene-3,4-dicarboxylic monoimide of the general formula VI



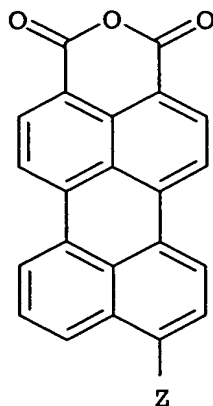
VI

to the desired 9-cyanoperylene-3,4-dicarboxylic monoimide of the formula Ic by reacting with copper(I) cyanide without a diluent or in a high-boiling inert diluent, optionally with the addition of a basic nitrogen compound or of a nitrogen heterocycle as a catalyst.

6. A perylene-3,4-dicarboxylic anhydride, substituted in the 9-position, of the general formula III



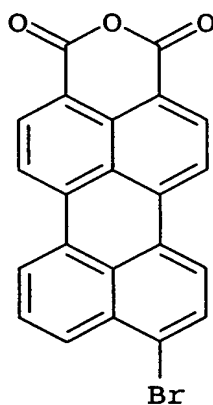
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III

where Z is bromine or cyano.

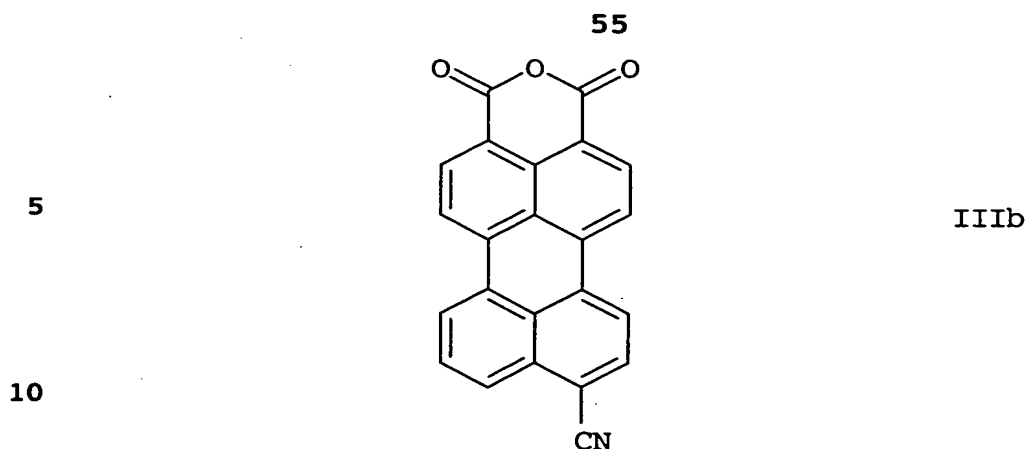
7. A process for preparing 9-bromoperylene-3,4-dicarboxylic anhydride of the formula IIIa



IIIa

which comprises selectively brominating perylene-3,4-dicarboxylic anhydride in the 9-position with elemental bromine in concentrated sulfuric acid or an aliphatic monocarboxylic acid.

8. A process for preparing 9-cyanoperylene-3,4-dicarboxylic anhydride of the formula IIIb



15 which comprises reacting 9-bromoperylene-3,4-dicarboxylic anhydride with copper(I) cyanide in excess in a high-boiling inert diluent, optionally with the addition of a basic nitrogen compound or of a nitrogen heterocycle as a catalyst.

20 9. The use of 9-cyano-substituted perylene-3,4-dicarboxylic monoimides of the general formula I as claimed in claim 1 or 2 for coloring high molecular weight organic and inorganic materials.

25 10. The use as claimed in claim 9, wherein plastics, paints, printing inks, inorganic-organic composites and oxidic layer systems are colored.

30 11. The use of 9-cyano-substituted perylene-3,4-dicarboxylic monoimides of the general formula I as claimed in claim 1 or 2 as dispersants, pigment additives for organic pigments and intermediates for the preparation of fluorescent dyes and pigment additives.

35 12. The use of 9-cyano-substituted perylene-3,4-dicarboxylic monoimides of the general formula I as claimed in claim 1 or 2 for producing aqueous polymer dispersions and inkjet inks absorbing and/or emitting in the yellow region of the electromagnetic spectrum.

40 13. The use of 9-cyano-substituted perylene-3,4-dicarboxylic monoimides of the general formula I as claimed in claim 1 or 2 as a coloring or color-correcting component in emissive and transfective color filters and in retroreflective components.

14. The use of 9-cyano-substituted perylene-3,4-dicarboxylic monoimides of the general formula I as claimed in claim 1 or 2 as photoconductors in electrophotography, as emitters in electroluminescence and chemiluminescence applications, as active components in fluorescence conversion, in bioluminescence arrays and in photovoltaics and as a laser dye.

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